

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 18

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

PAT. & T.M. OFFICE  
BOARD OF PATENT APPEALS  
AND INTERFERENCES

Ex parte GERNOT HOYLER

Appeal No. 2001-1612  
Application No. 09/096,113<sup>1</sup>

HEARD: OCTOBER 8, 2002

Before HAIRSTON, JERRY SMITH and SAADAT, Administrative Patent Judges.

SAADAT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the Examiner's final rejection of claims 1-20, which are all of the claims pending in the present application.

We reverse.

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<sup>1</sup> Application for patent filed June 11, 1998, which claims the foreign filing priority benefit under 35 U.S.C. § 119 of German Application No. 19724718.0, filed June 11, 1997.

BACKGROUND

Appellant's invention is directed to a computer-aided simulation method for determining the electromagnetic field of a body having a plurality of subregions, each containing a plurality of charges and currents. In each subregion, independent global and local multipole expansions are performed and the results are superpositioned to determine the electromagnetic field of the body.

Representative independent claim 1 is reproduced below:

1. A computer-aided simulation method for determining an electromagnetic field of a body which has a plurality of subregions and contains a plurality of charges and currents, comprising the steps of:

performing, in each case of the plurality of subregions, a global expansion, which represents an effect of charges and currents for distant points in a respective subregion of the plurality of subregions in the multipole expansion, and a local multipole expansion, which represents an effect of charges and currents at points inside the respective subregions of the plurality of subregions in a multipole expansion; and

determining the electromagnetic field of the body by superposition using the global multipole expansion and the local multiple expansion of the plurality of subregions.

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The Examiner relies on the following references in rejecting the claims:

Turner et al. (Turner) 5,424,963 Jun. 13, 1995  
Berne et al. (Berne) 5,915,230 Jun. 22, 1999  
(filed Nov. 21, 1996)

Ronald Coifman et al. (Coifman), "The fast Multipole Method for the Wave Equation, A Pedestrian Prescription," IEEE Antennas and Propagation Magazine, Vol. 35, No. 3, June 1993, pp. 7-12.

Mark A. Stalzer (Stalzer 1), "A Parallel Fast Multipole Method for the Helmholtz Equation," Parallel Processing Letters, Vol. 5, No. 2, 1995, pp. 263-274.

Mark A. Stalzer (Stalzer 2), "Parallelizing the Fast Multipole Method for the Helmholtz Equation," Parallel Processing Letter, Proceedings of the Seventh SIAM Conference on Parallel Processing for Scientific Computing, Feb. 1995; pp. 325-330.<sup>2</sup>

Vladimir Rokhlin et al. (Rokhlin), "Scalability of the Fast Multipole Method for the Helmholtz Equation," Mar. 1997, pp. 1-8.

Claims 1-20 stand rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

Claims 12 and 13 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite.

Claims 1-3, 14 and 15 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Rokhlin.

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<sup>2</sup> The information regarding this reference, although not clear from the text of the article, is provided by the Examiner and remains undisputed by Appellant.

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Claims 1-3, 14 and 15 stand rejected under 35 U.S.C. § 102(b) as being anticipated by either Stalzer 1, Stalzer 2 or Coifman.

Claims 4-13 and 16-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Stalzer 1, Stalzer 2 or Coifman in view of the official notice taken by the Examiner.

Claims 1-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Turner or Berne in view of the official notice taken by the Examiner.

Rather than reiterate the viewpoints of the Examiner and Appellant regarding the above-noted rejections, we make reference to the answer (Paper No. 13, mailed November 7, 2000) for the Examiner's reasoning and the appeal brief (Paper No. 12, filed October 3, 2000) for Appellant's arguments thereagainst.

#### OPINION

With respect to the 35 U.S.C. § 101 rejection of the claims, Appellant relies on the court decisions in State Street Bank & Trust Co. v. Signature Financial Group, Inc., 149 F.3d 1368, 47 USPQ2d 1596 (Fed. Cir. 1998) and in AT&T Corp. v. Excel Communications, Inc., 172 F.3d 1352, 50 USPQ2d 1447 (Fed. Cir. 1999) and points to the modifications made to the requirements for statutory subject matter (brief, page 7). Furthermore,

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Appellant argues that the claimed process of identifying the electromagnetic field associated with a body produces a "useful, concrete and tangible result" which is held by the Federal Circuit to be statutory (brief, pages 7 & 8).

In response, the Examiner relies on the decision in In re Warmerdam, 33 F.3d 1354, 31 USPQ2d 1754 (Fed. Cir. 1994) to assert that the claims merely represent "a mathematical algorithm" since they are drawn to a simulation process wherein no real world data is obtained by sensors and no output of the simulated data is processed (answer, page 8). The Examiner further argues that contrary to Appellant's assertion that the result of the claimed method is a "'tangible' thing," the specification does not define the body to be a real entity (answer, pages 8 & 9).

We agree with Appellant that the requirement for pre- or post-processing of real data has been modified by the decisions in State Street, 149 F.3d at 1373, 47 USPQ2d at 1600-01, as the practical application requirement was defined as producing "a useful, concrete and tangible result." Furthermore, the court in AT&T Corp., 172 F.3d at 1357, 50 USPQ2d at 1453-54, found that the claimed process in Warmerdam, as relied on by the Examiner, was non-statutory since it did nothing more than manipulate basic

mathematical constructs and concluded that "taking several abstract ideas and manipulating them together adds nothing to the basic equation." Thus, in contrast to the process in Warmerdam, Appellant's claimed computer-aided simulation method for "determining an electromagnetic field of the body by superposition" does not require a physical transformation of data to be statutory because the claimed limitation constitutes a practical application of a process represented by a mathematical algorithm which produces "a useful, concrete and tangible result." Accordingly, the rejection of claims 1-20 under 35 U.S.C. § 101 cannot be sustained.

Turning next to the rejection of claims 12 and 13 under the second paragraph of 35 U.S.C. § 112, we note that Appellant asserts that the term "mathematical stability," as recited in claim 12, is known to be defined as the ability to converge at poles of a system represented by mathematical equations (brief, pages 8 & 9). Appellant further asserts that the term "electromagnetic compatibility," as recited in claim 13 and defined and fully supported in the first page of the specification, is also known in the art (brief, page 9).

The Examiner's arguments are focused on the difference between the "stability of a method" and "stability of a body" in

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view of the language of claim 12 (answer, pages 9 & 10). The Examiner further argues that claim 12 does not call for "mathematical stability" although the specification may describe such feature (answer, page 10). With respect to claim 13, the examiner asserts that the electromagnetic compatibility of a body should be determined with respect to another body and questions the way claim 13 determines the compatibility of a single object (answer, pages 10 & 11).

Analysis of a rejection under 35 U.S.C. § 112, second paragraph, should begin with the determination of whether claims set out and circumscribe the particular area with a reasonable degree of precision and particularity; it is here where definiteness of the language must be analyzed, not in a vacuum, but always in light of teachings of the disclosure as it would be interpreted by one possessing ordinary skill in the art. In re Johnson, 558 F.2d 1008, 1015, 194 USPQ 187, 193 (CCPA 1977), citing In re Moore, 439 F.2d 1232, 1235, 169 USPQ 236, 238 (1971). "The legal standard for definiteness is whether a claim reasonably apprises those of skill in the art of its scope." In re Warmerdam, 33 F.3d 1354, 1361, 31 USPQ2d 1754, 1759 (Fed. Cir. 1994) (citing Amgen Inc. v. Chugai Pharmaceutical Co. Ltd., 927 F.2d 1200, 1217, 18 USPQ2d 1016, 1030 (Fed. Cir.), cert. denied

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sub nom., Genetics Inst., Inc. v. Amgen, Inc., 112 S.Ct. 169  
(1991)).

Upon a careful review of the claim language and the specification, we agree with Appellant that the limitation of "stability of said body," as recited in claim 12, refers to the stability of the body as represented by mathematical equations (specification, page 50, last two paragraphs). It is clear from the specification as a whole and page 50 specifically, that the charges are allowed to cancel out before multipole expansions are made in order to achieve stability and avoid errors as the frequency decreases. With respect to claim 13, we find that the definition of "electromagnetic compatibility" is set forth in page 1 of the specification as the "capacity of an electrical device to function satisfactorily in its environment without unacceptably affecting this environment." We disagree with the Examiner that based on this definition, the "electromagnetic compatibility" of a single body cannot be determined. As long as the potential affect of the body on its environment can be determined, we do not find any requirements in the above definition for determining compatibility with respect to another body, as suggested by the Examiner.

In view of our analysis above and in light of the specification as a whole, we find that the terms "stability of said body" and "electromagnetic compatibility of the body" are sufficiently defined and would reasonably apprise those skilled in the art of the scope of these limitations. Accordingly, we will not sustain the rejection of claims 12 and 13 under the second paragraph of 35 U.S.C. § 112.

We now turn to the rejection of claims 1-3, 14 and 15 under 35 U.S.C. § 102(b) over Rokhlin and alternatively over Stalzer 1, Stalzer 2 or Coifman. Appellant argues that none of the applied references mentions or suggests performing global and local multipole expansions and superpositioning the results of the two expansions for determining the electromagnetic field of a body (brief, pages 10 & 11). Additionally, Appellant points out that the Examiner has merely alleged that each of the applied references discloses the claimed features but has not identified the relevant teachings in the references (brief, page 11).

The Examiner responds to Appellant's arguments by asserting that the global and local multipole expansions are not different from the concept of near-field and far-field approximations which

are standard techniques (answer, page 13).<sup>3</sup> Additionally, in support of the rejection, the Examiner relies on the recitations of the terms "near groups" and summation of all "far groups" for computing "local interactions" in Rokhlin (answer, pages 13 & 14).

A rejection for anticipation under section 102 requires that the four corners of a single prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation. See Atlas Powder Co. v. Ireco Inc., 190 F.3d 1342, 1347, 51 USPQ2d 1943, 1947 (Fed. Cir. 1999); In re Paulsen, 30 F.3d 1475, 1478-79, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994).

After reviewing Rokhlin, we agree with Appellant's assertion that the reference includes no teaching or suggestion related to a global and a local multipole expansion and superpositioning the results of those expansions for simulating an electromagnetic field of a body. Rokhlin in section 5(2a) on page 4 merely provides that:

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<sup>3</sup> The Examiner cites an electromagnetic textbook authored by J.D. Jackson, which has not been considered by this panel because it is not a reference relied on in any of the rejections before us on appeal. Note In re Boon, 439 F.2d 724, 727, 169 USPQ 231, 234 (CCPA 1971).

For a given group  $m$ , the fields from all far groups must be translated to  $m$ , converted to near fields, and summed. This is done by a translation operator.

Contrary to the Examiner's assertion and different from the claimed superpositioning of global and local multipole expansion of the plurality of subregions, the disclosed summation is done after the far groups are translated and converted to near fields. Furthermore, we find nothing in Rokhlin that relates to the step of performing global and local expansions representing an effect of charges and currents for distant points and inside points of respective subregion, as recited in claims 1 and 14. Except for recognizing some of the terms recited in the claims, the examiner provides no specific correlation between the recited features and Rokhlin's disclosure, nor can we find the necessary teachings in the reference that relates to superpositioning of the global and local expansions. Accordingly, because Rokhlin cannot anticipate claims 1 and 14, the rejection of claims 1-3, 14 and 15 under 35 U.S.C. § 102 over Rokhlin is not sustained.

With respect to the 35 U.S.C. § 102 rejection of claims 1-3, 14 and 15 as anticipated by Stalzer 1, Stalzer 2 or Coifman, we also agree with Appellant (brief, page 11) that the Examiner has not specifically identified the claimed features in any of the references. The Examiner merely relies on terms recited in these

three references that are similar to some of the claimed terms and concludes that the claimed steps of performing global and local multipole expansions and determining the electromagnetic field of the body are also taught (answer, page 14). We further find that the Examiner improperly places the burden of providing evidence that the claimed process is novel over the prior art on Appellant (id.) as the Examiner fails to point to any particular teaching in the prior art that relates to superpositioning of the global and local expansions in the references. Thus, Stalzer 1, Stalzer 2 or Coifman cannot anticipate the claims because the claimed process steps of performing global and local expansions is absent in each of the references. Accordingly, we do not sustain the 35 U.S.C. § 102 rejection of claims 1-3, 14 and 15 over Stalzer 1, Stalzer 2 or Coifman.

Turning to the 35 U.S.C. § 103 rejection of claims 4-13 and 16-20, we note that each of dependent claims 4-13 and 16-18 recites features in addition to those of their base claims 1 and 14. The Examiner, in taking of the official notice, has not provided sufficient support to overcome the deficiencies of Stalzer 1, Stalzer 2 or Coifman above with respect to the rejection of base claims 1 and 14 and therefore, has failed to establish a prima facie case of obviousness. Additionally,

independent claim 19, similar to claims 1 and 14, includes the steps of performing global and local multipole expansions and superpositioning the results for determining the electromagnetic field of the body. For the same reasons discussed above, we agree with Appellant that such features are neither taught nor suggested by any of the references. Accordingly, the rejection of claims 4-13 and 16-20 under 35 U.S.C. § 103 over Stalzer 1, Stalzer 2 or Coifman in view of the official notice is not sustained.

Finally, with respect to the 35 U.S.C. § 103 rejection of the claims over Turner or Berne in view of the official notice, the Examiner relies on the teachings of Turner and Berne and further takes official notice that the details of the claimed "limitations concerning matrix operations as per the multipole expansion" as well as "the mechanics of the multipole expansion" would have been obvious to one of ordinary skill in the art (answer, page 7). However, Appellant argues that the Examiner fails to point to any teaching or suggestion found in the references for making such modification (brief, page 13). Appellant relies on the arguments made with respect to the taking of the official notice in the rejection over Stalzer 1, Stalzer 2 or Coifman above, and identifies the official notice as improper

for justifying the modification of Turner or Berne (brief, pages 11, 12 & 14). In response to Appellant's arguments, the Examiner apparently characterizes Turner's molecular structure as subregions of a body and Berne's multipole calculations in a top-down direction of a hierarchical structure of multipoles as the claimed superpositioning the results from global and local expansions (answer, pages 16-20).

A review of the references confirms that Turner relates to a computer-assisted method of generating a model of a molecule by partitioning the molecule into rigid and flexible bodies of atoms and solving the equations set up for the two bodies (col. 5, lines 3-62). Turner merely mentions multipole expansion techniques that reduce the computation time for evaluating the  $O(N)^2$  electrostatic terms in the energy function, producing results that are quantitatively similar to the exact calculations (col. 7, lines 44-52). Berne, on the other hand, discloses a method for molecular simulation that reduces the computation time by using a Fast Multipole Method to build a hierarchical structure of multipoles based on a tree structure (col. 3, lines 16-58 and col. 8, lines 54-62).

To establish obviousness, the Examiner must not only identify the elements in the prior art, but also show "some

objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead the individual to combine the relevant teachings of the references."

In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). "The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved." In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

Based on these well-settled principles and our findings above, we do not find that one of ordinary skill in the art would have modified the computer-assisted method of generating a molecule model of Turner or Berne and superpositioned the results from the global and local expansions for determining the electromagnetic field of a body. We further agree with Appellant that the Examiner has pointed to no specific teachings in the prior art that relate to performing a global expansion and a local expansion. In that regard, the Examiner's reference to terms such as "multipole expansion" and "local field" in Turner and Berne falls short of specifically identifying the claimed features in these references. Additionally, as Appellant points out (brief, page 13), by taking "official notice," the Examiner

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has not satisfied the initial burden of showing that the prior art itself would have suggested the claimed subject matter to one of ordinary skill in the art. In particular, the Examiner has not established why it would have been obvious to one of ordinary skill in the art to apply the superposition principle in combination with multipole expansions in electromagnetic field simulation to perform the claimed global and local expansions and superposition the results of the two expansions. Thus, we find that the Examiner has failed to set forth a prima facie case of obviousness because the necessary teachings and suggestions for modifying the references in view of the official notice to arrive at the claimed subject matter are not shown. Accordingly, we do not sustain the 35 U.S.C. § 103 rejection of claims 1-20 over Turner or Berne in view of the official notice.

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CONCLUSION

In view of the foregoing, the decision of the Examiner rejecting claims 1-20 under 35 U.S.C. §§ 101 and 103 is reversed. The decision of the Examiner rejecting claims 12 and 13 under 35 U.S.C. § 112, rejecting claims 1-3, 14 and 15 under 35 U.S.C. § 102 and rejecting claims 4-13 and 16-20 under 35 U.S.C. § 103 is also reversed.

REVERSED



KENNETH W. HAIRSTON  
Administrative Patent Judge



JERRY SMITH  
Administrative Patent Judge

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